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FARMERS' BULLETIN 1016
UNITED STATES DEPARTMENT OF AGRICULTURE

PROPAGATION and CULTURE of the DATE PALM

KANSAS STATE AGRICULTURAL COLLEGE
JUN 29 1920
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THIS BULLETIN is intended to furnish growers with definite instructions for the rooting of date offshoots and for their subsequent care in the orchard.

The only thoroughly satisfactory method yet devised for rooting young date offshoots consists in the use of a heavily manured nursery bed covered by a frame or shed so constructed as to give maximum heat and humidity. Water must be applied in ample and regular quantities.

Frequent irrigation and the maintenance of a high degree of soil fertility by the use of manure, mulches, and cover crops are essential to healthy growth and to the production of fruit in paying quantities.

First-class dates suitable for market can be produced only on soils in a high condition of fertility and tilth. This condition is most readily maintained on a well-drained sandy loam. Heavy soils need special attention to insure the proper penetration of the roots and distribution of water.

Localities where the settling of cold air causes the formation of dew during the ripening period may prove fatal to the more susceptible varieties of fruit.

The pruning of bearing palms should consist merely in the removal of old leaves, up to the fruit stems of the former crop.

Young palms should not be allowed to produce heavy crops of fruit, as this would be done at the expense of offshoot growth.

At the present stage of the industry the production of offshoots of proved varieties is of paramount importance.

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief
Washington, D. C. January, 1919

PROPAGATION AND CULTURE OF THE DATE PALM.

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ESTABLISHING DATE GARDENS IN CALIFORNIA.

EARLY in the present century two experimental date orchards were established in the Coachella Valley, Cal., one at Mecca (in 1904) by the Bureau of Plant Industry of the United States Department of Agriculture in cooperation with the horticultural department of the University of California, and the other at Indio (in 1907) by the Bureau of Plant Industry. A large number of the best date varieties of the Old World have been tested in these gardens.

For several years date culture offered little promise of immediate commercial success. Two factors were largely responsible for the doubtful conditions then existing—the difficulty experienced in ripening the fruits and the failure of many attempts to root offshoots of desirable varieties.

In 1910 a slow-maturation process of ripening the fruit of the Deglet Noor variety was discovered. This gave assurance of successful production in areas of high temperature adapted to the culture of dates of superior quality. The problem of rooting offshoots has now been worked out and no longer offers unusual difficulties.

It is the purpose of the present paper to give concise practical directions for propagating date palms by offshoots and for establishing a bearing orchard. The picking, curing, and packing of the fruit will not be considered at this time.

PROPAGATION OF THE DATE PALM.

The date palm is propagated either by seed or by offshoots. No other method is known.

PROPAGATION BY SEED.

Seed may be planted from the best varieties, but with no assurance to the grower that he will get a large percentage of commercial dates. Of the trees grown from seed 50 per cent are males. Male trees produce no fruit, but do produce pollen-bearing flowers that the date grower must have in order to pollinate or fertilize the flower spikes when they appear on the female or fruit-producing trees. The grower therefore needs a few select male trees for this purpose.

PROPAGATION BY OFFSHOOTS.

The offshoot of the date palm is a bud in the axil of the leaf; hence it is a direct product of the growing stem and in variety the same as the parent plant.

In some cases individual trees develop the offshoot buds much earlier and more rapidly than others of the same variety, and the varieties differ very markedly in their offshoot-producing habits. Generally, young palms should begin to produce offshoots in the third year and continue to produce them until the tenth or twelfth year. It has been found that varieties differ both in the length of time during which offshoots are produced and in the total number produced.

POSITION OF THE OFFSHOOTS ON THE TREE.

The first offshoot buds which develop are situated at or very near the base of the palm. After the third year these buds develop very rapidly, and at the end of the fourth or fifth year the grower should be able to cut an average of one or two offshoots for every tree in the orchard. Offshoot buds very often develop on the trunk of a palm from 2 to 4 feet above the base. Some varieties have been known to produce offshoots 6 feet above the ground, but this is very unusual in the Coachella and Imperial Valleys in southern California on account of the extremely dry atmospheric conditions. Along the coast in southern California, where heavy fogs and cooler temperatures prevail, the date palm seldom produces fruit, but will produce offshoots indefinitely. Offshoots 20 feet from the ground have been found growing on the trunks of old date palms at Santa Barbara, Cal.; also near the old town of Westminster in Orange County. Varieties at the cooperative date garden at Tempe, Ariz., have developed offshoot buds 6 and 8 feet above the ground on the trunks of palms that were 15 years old.

SIZE OF OFFSHOOTS WHEN READY FOR REMOVAL.

The proper size which the offshoot should attain before being cut from the mother palm has been the subject of much study and experiment. No data are available as to how large or how small an offshoot can be cut and rooted safely. It has been found that a medium-sized offshoot, weighing from 10 to 12 pounds, if well formed, of compact growth, and in good general condition, can be cut and rooted successfully, provided the grower can give the attention necessary for growing the offshoots in his own garden.

Large offshoots, weighing from 20 to 30 pounds, in many instances are very slow to start root growth, this delay being caused no doubt by the maturing and drying out of the shoot where cut. The standard size for cutting may be well placed at 12 pounds. To estimate the weight of an offshoot on the tree the following measurements may be used: When the diameter of the offshoot just above the base is $5\frac{1}{2}$ inches it will weigh about 12 pounds; with a diameter of $6\frac{1}{2}$ inches the offshoot will weigh 14 to 15 pounds. A slight variation may occur on account of differences in the method of pruning.

THE BEST TIME FOR CUTTING OFFSHOOTS.

Offshoots of various sizes and weights have been cut in every month of the year in order to determine the most favorable time for cutting. The date palm, unlike most other fruit trees, seldom has a dormant period during which growth ceases entirely. The cold period of December and January, when growth is at the lowest ebb, has not been found a favorable time for cutting the offshoots, and the period of the greatest summer heat, when growth is most active and the tissues are full of fermentable material, has proved still more unfavorable. For southern California and Arizona the most favorable time has been found to be from February 1 to May 1. Offshoots cut at this time not only resist the shock much better, but all exposed tissue hardens rapidly, which lessens the danger of fermentation after the offshoot is transplanted to the nursery.

PRUNING OFFSHOOTS PREPARATORY TO CUTTING.

Before cutting the offshoot it is necessary to prune back the inner leaves fully one-half their entire length. The outside leaves may be pruned back two-thirds of their length, leaving high stubs to protect the inside or crown leaves when the offshoot starts new growth. (Fig. 1.) It is not necessary to prune the offshoot until it is a mere stub, as such pruning will cause it to ferment very quickly unless growth starts immediately. Four to six days before cutting them is the best time to prune the offshoots. The pruning of young shoots on the mother plants will not injure them, and at times, where a

congested growth of the bud has been caused by the base of the leaf being held so firmly against the trunk that the offshoot bud has no chance to expand to its natural form, pruning is necessary.

IMPROVED METHOD OF REMOVING OFFSHOOTS.

The cutting of a date offshoot from the parent tree is a very critical operation and should be done only with the proper tools, and, if possible, by or under the supervision of some one who has had previous experience in this work.

FIG. 1.—Date offshoots pruned, ready for removal from the parent palm.

The chisel used for the cutting should be made of the best tool steel with a cutting bit 5 inches wide by 7 inches long. One side should be perfectly flat, and the reverse should be beveled for 2 inches on the sides as well as on the cutting edge, so that on all sides the edge is thin and sharp. The beveled edges will guide the chisel when driving it behind the offshoot and eliminate all danger of cutting into the heart, which often extends very nearly to the point of union between the offshoot and the parent tree. The handle or driving bar of soft iron should be 2½ or 3 feet long, 1¼ inches in diameter, and welded to the bit with a split or wedge weld in order to withstand the heavy blows of the sledge hammer which is used in driving the chisel into the trunk of the parent tree when cutting the offshoot. A crowbar makes one of the best handles, as it does not split when being driven and is easy to weld. (Fig. 2.)

To cut the offshoot from the tree the flat side of the chisel should always face the offshoot to be cut. Set the chisel well to the side of the base of the offshoot close to the main trunk. Drive it in with a sledge until below the point of union with the parent trunk; then

by manipulating the handle the chisel is easily loosened and cuts its way out. Next reverse and cut from the opposite side of the shoot until the two cuts come together. This operation will in most cases sever the offshoot from the trunk. No attempt to pry the offshoot from the tree should be made, as the tissues are so brittle that the terminal bud of the shoot may be ruined by checking or cracking. In cutting an offshoot directly at the base of a palm the soil should be dug away until the base of the offshoot is located and enough exposed to show the point of union with the mother plant. Then the chisel can be set without danger of cutting the roots of the parent tree so much as to injure or retard its growth. On such varieties as the Deglet Noor the connection of the offshoot is very small and there is no necessity for cutting deeply into the trunk to sever the offshoot from the tree.

FIG. 2.—The proper tools for cutting date offshoots. The sledge illustrated weighs 8 pounds.

SEASONING OFFSHOOTS BEFORE PLANTING THEM IN PROPAGATING FRAMES.

Date offshoots when cut from the parent tree are usually in a moist, sappy condition that causes the tissue to ferment very rapidly if they are planted in the propagating frame immediately after cutting.

By a series of experiments extending over a number of years it has been found that with proper seasoning offshoots will root more rapidly and that the chances of loss by fermentation and fungous attack are much less than when the shoot is planted in a fresh condition. The length of time the offshoot should be seasoned depends on the

size of the shoot, the time of cutting, and the position of the offshoot on the parent tree. Offshoots that are located at the base of trunks, which often have large spike roots, are very soft and tender when cut and will season more rapidly than shoots produced above the ground. Hence, while an offshoot weighing from 12 to 20 pounds at the base of the trunk should be seasoned at least 10 days, an offshoot of the same weight located on the trunk above the ground should be seasoned not less than 15 days before planting in the propagating frame, as the evaporation from the upper shoot is much slower than from the lower one.

A shoot at the base of the trunk weighing 15 pounds when cut and then seasoned for 10 days should weigh 13 pounds, a loss in weight of 13.5 per cent, due to the evaporation of part of the water in the tissues. On the other hand, a shoot that is cut above the ground, being hard and compact, at the end of 15 days will have lost only the same relative weight.[1]

Offshoots after being cut from the parent tree either should be left on the ground under the tree or set up in groups of 15 or 20 in a place in the open, where the air will circulate freely about them. They should not be watered until they are planted in the nursery bed. Offshoots ricked up like cordwood or covered with canvas have been known to ferment very rapidly. After the time of seasoning has elapsed the offshoots should be set immediately in the nursery bed.

SHED PROPAGATION OF DATE OFFSHOOTS.

With the average date grower the rooting of date offshoots in the field nursery has not been successful. The high percentage of loss in many instances has discouraged the grower at a time when success in rooting offshoots is the most important phase of this new and promising industry. It has been found that high temperatures combined with high humidity are the two essential factors in rooting offshoots. Hence, a shed frame has been developed which, if properly constructed, will furnish both heat and humidity, and this frame is coming into almost universal use for this purpose. (Fig. 3.)

[1] Experiments made at the garden at Indio, Cal., to ascertain the total water content of small date offshoots (cut on March 2) gave the following results:

Variety.	Date.	Weight—			Percentage of loss.
		When cut.	When dry.	Loss.	
		Lbs. Oz.	*Lbs. Oz.*	*Lbs. Oz.*	
Deglet Noor	Mar. 2	6 11	1 11	4 13	74
Maktum	do	12 7	2 9	9 14	79.3

CONSTRUCTION OF THE PROPAGATING FRAME.

The offshoot propagating frame is made on the same principle as the common coldframe for forcing small plants, but 12 by 20 feet in size or larger, with walls 6 feet high on the lower side and with a slope of the roof toward the sun of about 1 foot in 10 feet. It should be covered with 8-ounce or 10-ounce canvas instead of glass. It should be so constructed as to eliminate all air currents inside of the frame and keep the air as warm and moist as possible throughout the night.

To erect a shed of this kind 2 by 4 studding can be used for the frame, with 1 by 12 inch rough boards for inclosing it. The sides

FIG. 3.—Interior view of a date-offshoot propagating frame at the Government Date Garden, Indio, Cal.

and ends are then covered on the outside with 1-ply or 2-ply roofing paper, with the lap cemented and nailed. The rafters to support the canvas are put across the frame every 3 feet. A strip of roofing paper 3 inches wide should be tacked on the rafter before the canvas cover is put on, as the vibration of the canvas in the wind when placed in direct contact with the rafter soon wears it through. These 3-inch strips of paper act as a cushion, and when so protected the canvas will last from 1 to 3 years. Battens half an inch thick by 1½ inches wide should be nailed on each rafter over the canvas roof. The single one-tenth pitch roof has been found the most practical and should face the south or southeast, so as to receive the full sunlight for 6 hours of the day.

THE NURSERY BED.

A light sandy loam, well drained, should be used for the rooting of date offshoots. The amount of water that it is necessary to use on the shoots while rooting makes the character of the soil a matter of vital importance. From 8 to 12 inches of the surface soil should be excavated from the bed and replaced with good fresh stable manure well packed; then 2 inches of soil should be spread over the entire surface of the bed. The bed should then be flooded until the manure is thoroughly soaked. After four to six days, during which time considerable heat may be developed by the fermenting manure, the bed should be well flooded a second time. The offshoots can then be set in the nursery with safety.

DEPTH OF SETTING OFFSHOOTS IN THE NURSERY BED.

The depth of setting the date offshoot must be determined by its form and size, as some shoots have a long slim trunk, while others are very short with large bases. A depth of 8 inches has been found to cover practically all the rooting surface; consequently an offshoot weighing from 12 to 20 pounds can be planted safely at a depth of 8 inches. Where the unrooted offshoot is planted too deep there is danger of the crown or bud being flooded over when irrigating, which in hot weather generally proves fatal.

IRRIGATING OFFSHOOTS IN THE NURSERY BED.

From April 1 to October 1 the offshoots should be irrigated twice a week. During these months, when the maximum temperatures in the propagating frames are high, the humidity should be kept at the highest point possible. To effect this, there must be no drying out of the nursery bed. It should be borne in mind by the grower who contemplates the propagation of his offshoots that the value of a small nursery is so great that he can well afford to give it all the attention it requires; if he can not give it the necessary attention the offshoots should be sold or left on the trees.

During the late fall and winter months the bed can be irrigated once every 10 days. The furrow method or flooding can be used in irrigating the bed, but in either case the water should be shut off as soon as the moisture has penetrated the surface thoroughly. The writer prefers the method of flooding, as it takes only a few minutes to cover the bed, whereupon the water can be diverted without danger of getting the offshoots submerged. The bed should be level, so that the water will be distributed equally to all parts.

LENGTH OF TIME THE OFFSHOOTS SHOULD REMAIN IN THE NURSERY BED.

It is impossible to state the exact length of time that offshoots should remain in the nursery bed, but in no case should they be transplanted to the field until they are well rooted.

When the root system is sufficiently developed for removal, the offshoot should show from five to seven new leaves. As the leaves develop on the shoots in the nursery bed they usually appear in sets of three, and the second set should be starting to expand before the offshoot is transplanted to the field.

There is a wide variation in the time of starting and in the rapidity of growth of offshoots in the nursery; some will start new growth quickly, while others will linger and in some cases stay dormant for three or even four years and then begin to grow rapidly. The experienced date grower will look on such behavior on the part of the offshoot as natural and will apply only such stimulation as is necessary to revive it, while the inexperienced grower is likely to abandon such plants, which would represent a total loss. The methods here recommended for the propagation of offshoots, it is expected, will decrease the time of rooting and increase to a maximum the percentage of living shoots secured.

The loss of large numbers of offshoots in the Coachella Valley has been due to inexperienced or inefficient help. Growers can not afford the loss of valuable offshoots at this time, when so small a supply is available.

Causes leading to failure to grow a high percentage of offshoots may be summarized as follows: (1) Improper selection of the location for the nursery bed, (2) failure to construct the frame so nearly air-tight as to insure the necessary humidity and high temperature, (3) improper methods of cutting and pruning and the neglect of seasoning before planting in the nursery bed, and (4) the neglect of irrigation when necessary and the failure to apply water properly.

The points above mentioned are all essential to success, and to neglect one and observe the others may lead to as great a failure as to neglect them all.

TRANSPLANTING OFFSHOOTS TO PERMANENT POSITIONS.

The distance of spacing date offshoots in orchard or garden planting should be governed by the variety and the soil.

Experience with over a hundred varieties in the Coachella and Imperial Valleys in southern California shows that in medium sandy loam the best production of both fruit and offshoots is provided for when the palms are planted 30 feet apart. A few varieties, such as the Saidy, Thoory, and Tazizaoot, would give much better results if planted 35 to 38 feet apart.

The rooted offshoot when ready for transplanting should be pruned from three to five days before removing it from the frame. The new growth should be cut back to one-half the original height, leaving from three to five leaf stubs to support the expanded crown leaves. The holes in the field should be 3 feet in diameter and 3 feet

in depth, with from 12 to 16 inches of stable manure placed in the bottom of each and 6 inches of soil on top and then irrigated thoroughly. The rooted palm when removed from the nursery should carry a ball of earth large enough to protect the small fibrous roots from exposure to the sun or dry winds. The average depth for planting should be 16 inches, but this may be varied somewhat with the size of the shoot. In any case the depth should be as great as possible without danger of covering the bud.

It is not advisable to transplant rooted offshoots later than June. April and May are considered the best months for transplanting either young or old date palms.

In southern California, where the dry winds occur from March until June, the transplanted palms should be irrigated thoroughly every week; in sandy soil two irrigations a week should be given until new, strong growth is established.

WINTER PROTECTION FOR YOUNG DATE PALMS.

Rooted offshoots when removed from the propagating frame are usually very tender and are very often slow in starting growth; hence, it is necessary to protect the trees during the following winter from freezing temperatures, which usually occur from December 1 to February 1.

Various methods have been used for frost protection, such as wrapping with canvas, burlap, and paper; of the three, paper has been used very successfully. During the winter of 1913, when the temperature dropped to 15° F. above zero, young date palms that were wrapped in canvas and burlap were killed, while those wrapped in paper were not injured.

Full sections of newspaper make good wrapping material for frost protection. The paper should be wrapped loosely around the young palm and tied loosely at the bottom and again in the center of the tree, leaving the top open. This cover can be left on the tree until April 1. In case the tree has made from 12 to 16 inches of growth while wrapped, the leaves should be pruned back 6 or 8 inches, as very often high winds break the leaf in the crown, causing injury which may be fatal to the young tree.

The leaves of the young palm may be frosted severely without injury to the bud, and in such cases as soon as the cold weather is over the frozen parts should be pruned back to the new tissue. Should the bud be killed by severe freezing the stump should not be destroyed at once, as offshoot buds will often develop rapidly around the base.

IRRIGATING THE DATE GARDEN.

On account of the extreme variation of soils in the date-growing regions of southern California, unusual care is necessary in selecting

the proper method of irrigating a date garden. The roots of the date palm feed deeply, and it is necessary that the soil be kept thoroughly moist during the entire year.

THE BASIN METHOD OF IRRIGATION.

The basin method of irrigating date palms has been found very satisfactory, provided the basin is filled with straw or stable manure as a mulch. Basins should never be left exposed to the sun and dry winds without a covering of mulch, as the evaporation is very great and the moisture will have no chance to penetrate to the roots. The basin should be fully 15 feet square and 1 foot deep. This leaves a strip in the center between the rows that can be used for growing leguminous crops, such as alfalfa or sesban. Care should be taken that the basins are constructed so as to retain the water and give an equal distribution to each tree in the row. During the fall, when the dates are ripening, the basins can be filled with water every week, if necessary, to hasten the maturing of the fruit.

THE FURROW METHOD OF IRRIGATION.

In clean-cultivated soils, irrigating in furrows is perhaps the best method, running the water for 24 hours every 12 days from May 1 to November 1. Variations of the soil must be considered, however, as the writer has found that in many cases where water has been running for 36 hours it has penetrated to a depth of only 6 inches. Conditions of this kind may occur in light loam as well as in heavier soils. A thorough investigation after each irrigation should be made, in order to satisfy the grower that the moisture has reached the roots of the palms. As soon as possible after each irrigation by this method the orchard should be cultivated thoroughly, using a surface cultivator or a spring-tooth harrow to conserve the moisture, which would otherwise evaporate in 48 hours. For fruit and offshoot production proper irrigation is just as important as fertilizer, and without the two the commercial establishment of date culture can never be accomplished.

FERTILIZING THE DATE GARDEN.

The growth of the young palm after transplanting is very slow, and good care must be given the plant in order to induce a strong growth. On account of the very limited number of offshoots from choice varieties growing in the United States, the grower should realize that offshoot production by the mother palm is one of the most important factors in developing the date industry; therefore, in order to secure the very highest efficiency in production the mother plant should have a strength and vitality which can be obtained only by fertilizing the soil and by proper care and management.

In order to get the maximum production of offshoots it has been found that after the palm has been in the field for a year, growth should be accelerated by the use of frequent applications of fertilizer, such as stable manure, and by growing such cover crops as sesban, alfalfa, or wheat between the rows. Sesban, as a summer crop, produces an abundance of available nitrogen, while wheat can be grown for the straw, which gives when turned under a good bed of humus. In the desert soils of the Coachella and Imperial Valleys a hard layer of silt and sand is often found at a depth of 1 to 3 feet that is almost a hardpan. This is very difficult to penetrate with water, and naturally the palm roots are slow in penetrating this layer. Experiments with alfalfa planted in strips 15 feet wide between the rows have shown that its roots will break through this hard layer and allow thorough penetration by the palm roots.

The straw mulch should be turned under dry; green crops used in this way during the hot summer months ferment too rapidly. Where manure is available it should be applied to the date palm in the fall or winter. Two methods of application have been used successfully—in basins and in deep furrows.

The basin should be from 8 to 12 feet square and 1 foot in depth. The manure should be applied directly around the tree, and a little soil should then be thrown over the manure in order to make it compact and promote rapid decay. When applying manure by the furrow method a 12-inch breaking plow should be used, making a large open ditch 4 to 6 feet from the tree. The manure should then be thrown in the ditch on each side of the tree for a distance of 8 to 12 feet, and the breaking plow should again be used to fill up the ditch, leaving the last furrow open for immediate irrigation. It should be clearly borne in mind that whenever manure is applied in large quantities around the trees, irrigation should follow at once and at intervals of three days until they have had at least three successive irrigations.

Trees from 4 to 6 years old should have one-half cubic yard of manure each year until they cease to produce offshoots; after reaching this age 1 cubic yard can be applied, which with the help of cover crops should keep the tree in a condition to produce fruit each year.

Manure can usually be secured at from 80 cents to $1 per cubic yard; hence the cost per acre for this kind of fertilizer is $40 to $50. When available, gypsum may be applied with the manure to good advantage, as the action of the gypsum practically eliminates all danger of injurious heat from the manure.

If continuous crops of fruit of high quality are to be produced, the date palm must be well fertilized; otherwise, it will produce fruit only every other year and that of poor quality. (Fig. 4.)

SOILS SUITABLE FOR DATE GARDENS.

The date palm can be grown in a wide range of soils, from a heavy adobe to a light sandy loam. It will thrive under conditions showing slightly more alkali than is tolerated by such farm crops as alfalfa,

FIG. 4.—A 12-year-old date palm at the Government Date Garden, Indio, Cal., showing a heavy crop of fruit resulting from proper irrigation and fertilization.

wheat, or barley. With a soil that is too sandy it is difficult to maintain the proportion of humus necessary for the proper retention of moisture, and the fertilizing elements necessary to the production of commercial fruit crops are quickly leached away. These facts make it necessary to give this class of soils special attention in the

application of stable manure or in growing and plowing under crops of nitrogen-fixing legumes.

With a heavy clay soil, on the other hand, much care must be taken to keep the soil in such a tilth as will secure the right penetration and distribution of water to the roots. Proper aeration and drainage must be carefully looked after in this class of soils. A rich well-drained sandy loam will give the best results, not only in the growth of the tree and offshoots but in the quantity and quality of fruit.

It is not advisable to plant dates in very light sandy soils unless the subsoil under the sand is heavy enough to support the palm after the root system has become established. Light shifting sand also injures the young fruit during the spring months, when high winds prevail. Such injury can be prevented to some extent by sowing rye or wheat among the palms in the fall or winter; but the cost of water and fertilizer should be considered very thoroughly by the grower before planting dates in such soils for commercial purposes.

CHOICE OF LOCATION OF DATE GARDENS.

While the mean temperature of a given section of country may be ample throughout the growing season for the maturing of a date crop, local conditions may prevail which will prevent the success of the more delicate varieties. The Deglet Noor, for example, is very sensitive to moisture, either as rain or dew, as the ripening process begins. In a section subject to rainfall in September or October or one where from lack of air drainage cool nights develop a dew point, it has been found that a large percentage of fruit of this variety is in some years lost by the development of a spot fungus, though the tree growth and setting of fruit may be all that could be desired. Other varieties, however, may be found on trial to succeed under such conditions.

The date palm requires a long growing season in summer with intense heat and a dry atmosphere. It should not be subjected to lower temperatures than 12° to 15° F. in winter.

The successful commercial culture of dates will probably be limited to such regions as the Salton Basin and the hot interior valleys of central California, the valley of the Colorado to the Nevada line, the lower Salt and Gila River valleys in Arizona, and possibly a small portion of the lower Rio Grande Valley in Texas. Such regions as the Gulf coast of Florida, the Gulf States generally, the Pacific coast southward from San Francisco, and parts of Texas are too humid to permit the fruit to ripen properly, though palms in those regions sometimes produce fruit of fair quality, suitable for home consumption in a fresh state.

PRUNING DATE PALMS.

The young palm should be pruned very lightly during the first three years. Unless some of the leaves are dry and dead there is no necessity for pruning until the palm is 4 years old in the garden; then two rows of leaves may be cut. At this age the young palm should be producing offshoots vigorously, and severe pruning would be fatal to the new offshoot buds. During the fifth year from one to three offshoots will be cut, and pruning of the leaves should be done only at the point where the shoot is severed from the trunk.

FIG. 5.—A date palm properly pruned.

After the sixth year the palm should be pruned regularly each year in December or January. The leaves should not be pruned higher than the fruit stems of the former crop, which will leave about four rows of leaves below the new fruit stems, or approximately 30 to 36 expanded leaves. This number is ample to support the crop of fruit, while pruning up to the new fruit stems injures the fruit and may destroy the entire crop. (Fig. 5.)

FRUIT PRODUCTION IN RELATION TO OFFSHOOT PRODUCTION.

The general habit of the date palm when fruiting is to overproduce. This has been found to be a very serious handicap to offshoot production, for if a tree is allowed to produce large crops of fruit at an early age it will develop but few offshoot buds. The grower should realize that the value of a young palm of a desirable variety is not measured solely by the quantity of fruit it produces, but in a large degree by its ability to produce offshoots that will serve to increase his plantings. Under favorable conditions this increase should amount to tenfold every six years.

Four-year-old palms, if strong and vigorous, should be allowed to produce only two bunches. At the fifth or sixth year three or four bunches may be left, provided the palms have an abundance of water and fertilizer.

At all times the strength and vigor of the palm should be first considered by the grower in connection with fruit production, and it must be clearly understood that the future development of the date industry in the Southwest depends for the present on the production of offshoots instead of fruit.

FIG. 6.—Flower clusters of the female date palm as they appear on the tree.

POLLINATION OF DATE PALMS.

For pollination the male is essential to the date grower. In order to get perfect mature fruit the pollen from the male flower must come in contact with the pistils of the female or fruit-bearing cluster. The female palm blossoms from February until June, although March and April are the months in which nearly all the spathes open. It is very important that the grower have male palms from which he can secure pollen during this period, as without them the entire crop will be a failure. The grower should, therefore, be careful in the selection of male trees. There is great variation among males, both in fertility and in time of blooming. Many male palms are sterile, while others bloom so irregularly that the grower can not depend on them to pollinate his crop. In the Coachella and Imperial Valleys, where large numbers of date palms have been grown from seed, the grower is usually very anxious to destroy all males as soon as they appear. This should not be done until he has made his selection for permanent planting.

In selecting male trees the first point to be considered should be the time of blooming, early flowers for use on early female blossoms

being desirable. The next consideration should be abundance and fecundity of pollen, though the latter can be determined only by trial. These two points constitute the important characters to be secured in a permanent selection. A thoroughly tested male of proven high potency for use on any one of the standard fruiting varieties is a valuable asset and when obtained should be multiplied by rooting as many of the offshoots as are needed. Considering the fact that when the most careful selections have been made there are

FIG. 7.—Flower clusters of the male date palm as they appear on the tree.

seasons when some of the male palms will be sterile, there should be at least two males for each acre of 50 bearing trees, so that the grower may always be sure of an ample supply of pollen for his garden.

Male palms can be used for planting along driveways or as border rows around a garden, as nothing is gained by planting them among the female trees.

It is not advisable to pollinate the fruit clusters blooming later than May, though in seedling nurseries where the palms are being tested fruit clusters may be pollinated until the first of August. Very few, if any, of the dates are likely to mature from such late pollinations, but the size and color of the fruit can often be determined, which will be an aid in final selection.

While in a palm grove of unselected seedlings, with the trees of both sexes crowded together, the wind-blown pollen reaches many of the pistils, pollination in this way is unreliable.

To insure a setting of fruit it is necessary to pollinate artificially each fruit cluster by hand. Unpollinated dates are seedless and do not mature perfectly; hence, in order to secure dates of commercial value the pollination of the fruit cluster is always necessary. This is a very simple operation and can be done by anyone.

FIG. 8.—Flower cluster of a male date palm just emerged from the sheath and letting the pollen escape. (One-fifth natural size.)

FIG. 9.—Female flower clusters: To left, just opening; in center, pollinated, showing male twig; to right, 10 days after pollination. (One-fifth natural size.)

In the first place, the grower should be able to recognize the difference between male and female blossoms. The writer has found in many seedling gardens male palms that were pollinated by new settlers who did not know the male from the female blossom. (Figs. 6, 7, 8, 9, and 10.) When the spathe opens on the male, it should be tested immediately to see if it contains pollen. By shaking the blossom gently, if fertile, the pollen will fall on the hand as an exceedingly fine yellow powder. The blossoms should be cut at once and put in a large paper bag to dry, and then stored in a room with the bag open. Mildew will destroy the pollen very quickly unless kept perfectly dry. Dry pollen can be kept and used for an in-

definite period. The writer has used pollen that was kept in a bottle for ten years, securing a perfect setting of fruit. The date grower should always keep a good supply of dry pollen, as during some seasons both the male and female trees bloom irregularly. When using pollen that has been kept over from one season to the next, a small piece of cotton should be rolled in the pollen and inserted into the cluster, just as in using a sprig of the fresh flower cluster.

When possible, however, the grower should use fresh pollen. The sprigs can be clipped from the blossom into a tight box or basket and carried through the garden without loss of pollen. This makes the work of pollination very simple and convenient. One or two

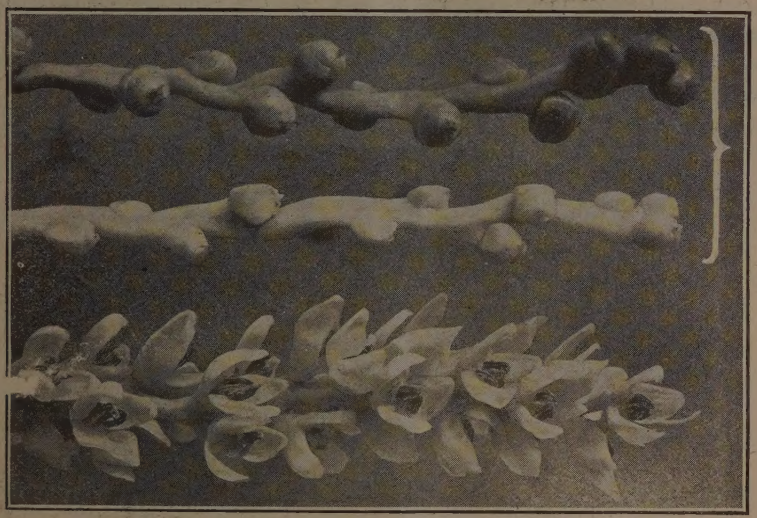

FIG. 10.—Female and male flowers of the date palm, magnified: Above, young fruits a week after pollination; in middle, female flowers ready to be pollinated; below, male flowers shedding pollen. (Three times natural size.)

sprigs from the male blossom will be ample for each cluster of dates. If the spathe inclosing the female cluster is cracked and not entirely open, it should be opened and the pollen applied. The sprig from the male blossom should be turned with the open flowers downward, put at the top of the fruit cluster, and tied in place, using a small string or strip from the palm. One pollination for each cluster is all that is necessary unless a rain should follow within 24 hours after pollination, in which case the pollen should be applied again.

Varieties differ in the length of time that may elapse between the opening of the female spathe and pollination. A series of experiments extending over a period of 15 days in the pollination of the Deglet Noor, Thoory, and Saidy varieties with the clusters bagged and three to five threads pollinated every 24 hours showed that pol-

linations up to the eleventh day gave 98 per cent of the fruit set on the Deglet Noor, 50 per cent on the Saidy, and about 25 per cent on the Thoory. No additional fruit set from pollinations later than eleven days. The safe method for the date grower will be to look over the garden every third day and pollinate the fruit clusters that are ready.

Pollen from ornamental palms should not be used by the grower for pollinating commercial dates. Palms of this type blossom very irregularly and only a small percentage of the blossoms contain pollen. The hybridizing of date palms and breeding by selection are projects still in the experimental stage and should be attempted at agricultural experiment stations only, where there will be no chance for untested seed from such pollinations to get into the hands of an unsuspecting grower who is starting a seedling date garden. The seedling date palm has an important place in the home fruit garden and has a distinct landscape value also, but it should not be depended upon where the production of dates in commercial quantities is the object of planting.

PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE RELATING TO DATE CULTURE, FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

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Persian Gulf dates and their introduction into America. Bureau of Plant Industry Bulletin 54, 32 pp., 4 pls. 1903. Price, 10 cents.

The date palm and its utilization in the Southwestern States. Bureau of Plant Industry Bulletin 53, 155 pp., 10 figs., 22 pls. 1904. Price, 20 cents.

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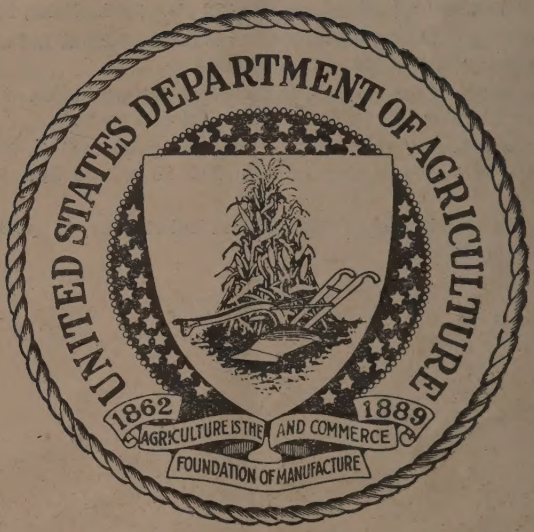
WASHINGTON : GOVERNMENT PRINTING OFFICE : 1919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